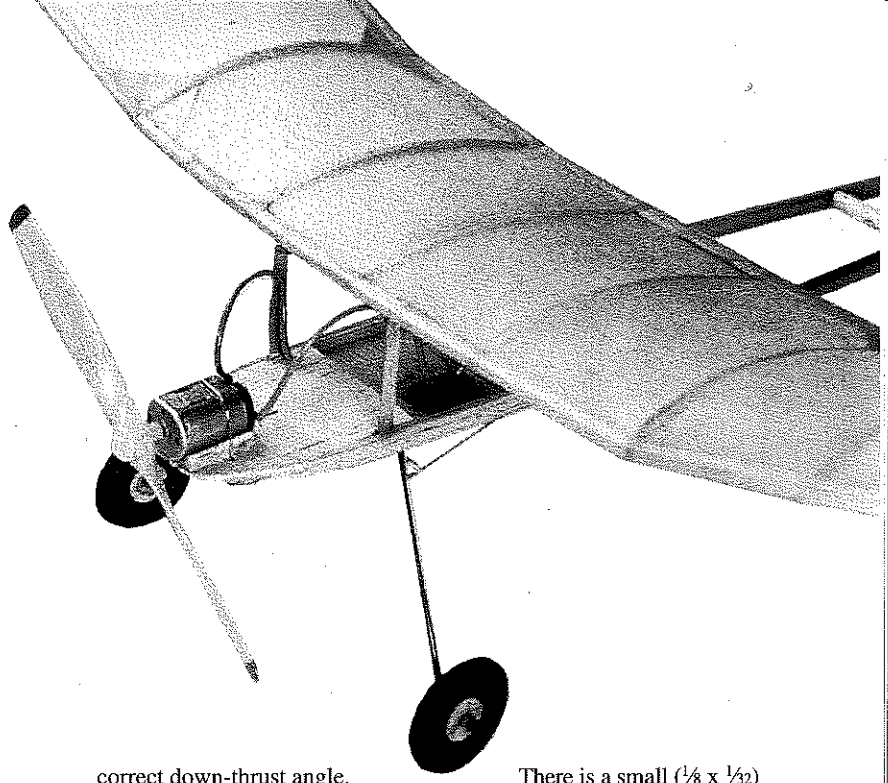
FLYING ACES STICK



A new subminiature motor inspired the creation of this Electric free flight model.

■ Roland Schmidt

THE INTRODUCTION of the subminiature KR1 motor (Mabuchi N20A0) by Kenway Micro Flight (Box 889, Hackettstown, NJ 07840) has opened a new realm of aeromodeling—*really small* electric-powered free flight models for indoor or outdoor flying.

The Flying Aces Stick was one of the first really successful gas-powered sport models. It was capable of flight with a wide range of motors, from Baby Cyclones to Ohlsson Gold Seals. It is inherently very stable and is not sensitive to adjustments. Our little replica is much the same and will give the builder much enjoyment.

Our model is very simple—it almost builds itself. However, weight is of prime importance; an accurate gram scale is almost a necessity. The builder must select materials with more than the usual care, and adhesives and dope must also be used sparingly.

Kenway recommends that your model—minus prop, motor, switch, and batteries—weigh *no more than* eight grams. Flying weight is 24 grams. The prototype weighed 4.5 grams when new. After a few collisions with walls, ceilings, basketball hoops, etc., and subsequent repairs, its weight climbed to 5.1 grams, but performance was not degraded.

Most of the model was built from six-pound-density balsa, except for the wing's leading and trailing edges and the longerons, which were cut from eight-pound-density wood.

The wingtips are formed from 1/16 x 1/32 strips that have been presoaked in household ammonia for at least 30 minutes, wrapped around a prewaxed form, allowed to dry, then bonded with thin cyanoacrylate glue (CyA). It is best to preshape and prebevel the wing leading and trailing edges before constructing the wing panels. Do not install the wing ribs and gussets at the dihedral joints until the outer panels are assembled to the center section at the proper angle. Carefully fit the gussets to achieve maximum strength.

The wing was covered with Japanese tissue that had been preshrunk with water, lightly misted with very thin (5:1) Sig Lite-Coat dope while still on the shrinking frame, and allowed to cure for 72 hours. This minimizes warpage from temperature and atmospheric changes.

To prepare the wing for covering, lightly sand the structure to remove all irregularities, then dope the top surface of the ribs, tips, leading edge, and trailing edge. Sand lightly again. Cut the preshrunk tissue from the frame, and attach to the structure with thinner. Use only conveniently sized pieces of tissue—so that an area can be covered smoothly without wrinkles. Imagine your tissue is sheet metal, which can only be bent in one plane.

The fuselage longerons are assembled to the 1/16-sheet floor, then the laminated nose former is fitted. Do not omit the 1/16-square piece between the floor and the back of the nose piece—it establishes the correct down-thrust angle. There is a small (1/8 x 1/32) cutout in each corner of the floor and nose former to allow the wing struts to be inserted. Install the front crossmember, taper the inner surfaces of the longerons, draw them together, and cement in place. Install the remaining crossmembers.

The tail surfaces are shaped from quarter-grained 1/32 sheet. Do not omit the leading edges—these combine with the quarter-grained sheet to minimize warpage. Sand and mist with thinned dope as mentioned above. Lightly sand again to eliminate fuzz.

Bend the landing gear as shown. The main wheels are roughly shaped from 1/8 sheet, and the centers have a 1/16 hole. Thread in a 2-56 machine screw, and secure the wheel blank with a washer and nut. Chuck the screw in an electric drill or Dremel Moto-Tool, and shape the blank with a sandpaper block or emery board. Remove the screw, and cement in a 1/4-inch-long piece of 1/32 I.D. aluminum tubing to serve as an axle bearing.

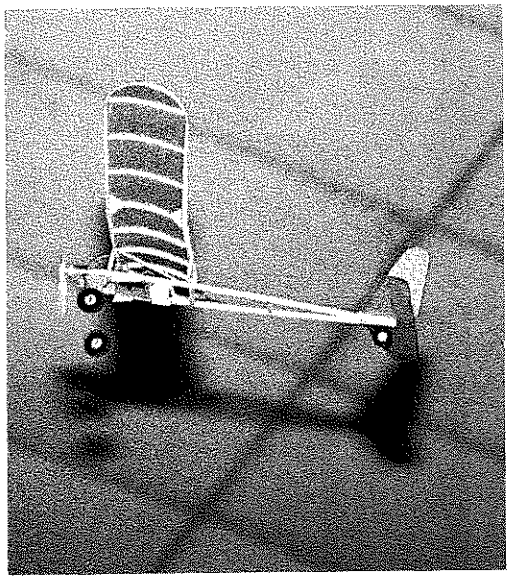
Install the wheels on the gear, and retain with a washer and a drop of cement. *Warning:* Do not use CyA here, or the wheels may not rotate in spite of your care. Use CyA to glue the landing gear in the area just forward of the floor pan and under the rear of the nose former. Brace with the 1/32 plywood gussets as shown.

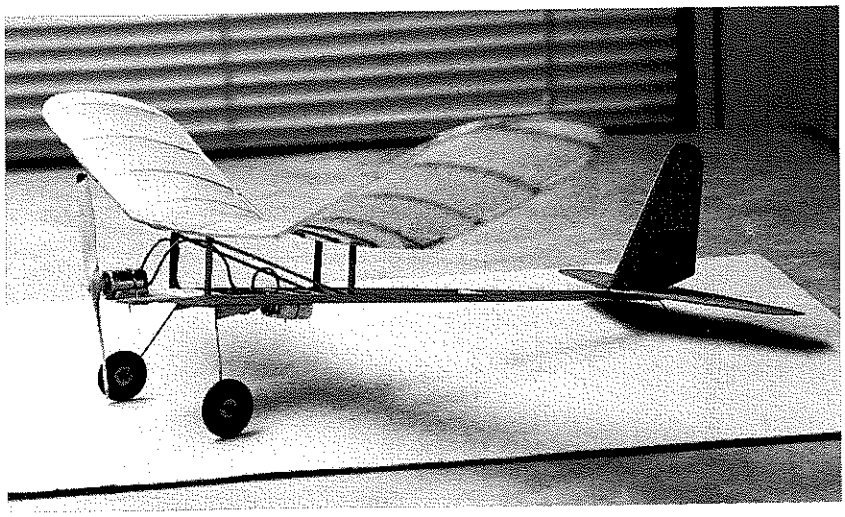
The plan shows a tail wheel, which was not on the original Stick—it just had a tail skid. If you are flying from a polished gym floor, a tail wheel is almost a necessity for straight takeoff runs, and the Stick *does* require a takeoff run of four to five feet.

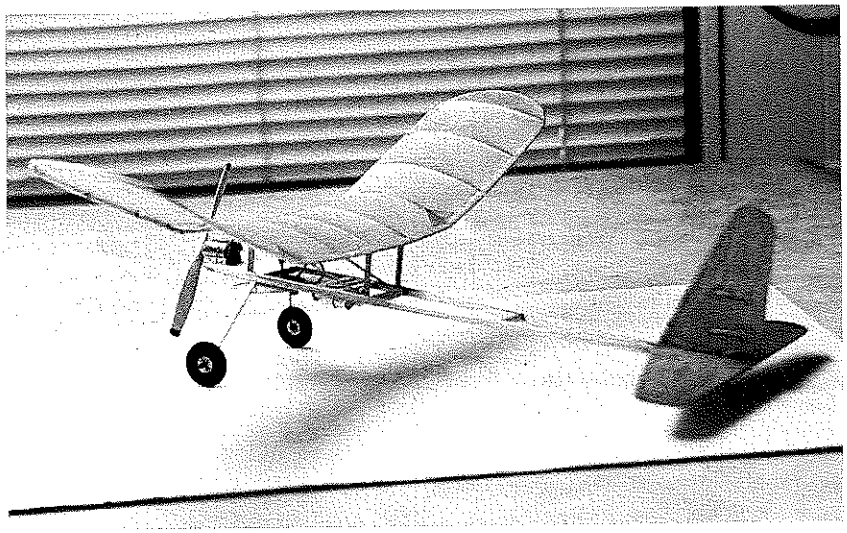
The tail wheel is made in the same manner as the main wheels, except the wheel is only 1/16 thick, and it is turned to a diameter that is a snug fit to the O-ring. Mount the tire, and secure with CyA. After the CyA has set, and with the wheel still chucked up, sand the O.D. of the tire to expose the softer rubber (plastic?). Those of you who have flown tail-draggers with swiveling tail wheels will remember the sequence of "lock tail wheel" to minimize ground-loops!

The motor is mounted between small "cheeks" and is held snugly (not tightly) by the wire bail, which is tightened by twisting the ends together. This mounting was chosen to allow the motor to slip backwards in case of impact to protect the .039 shaft. The angle of the cheeks allows for side thrust adjustments by means of shims between the cheeks and the rear of the motor. By the same token, shims can be placed under the front or rear of the motor to decrease or increase the downthrust.

Prewire the switch with several inches of wire before installation and before mounting the wing. Install the wing cabane struts, making certain that they are the correct length, are vertical, and are firmly cemented to the full depth of the longerons. Care must be taken to be certain that the tail surfaces are mounted squarely; in







Above: The Flying Aces Stick sweeps cobwebs from the ceiling of the Bedford Boys' Ranch, in Bedford, Texas.

Above right: Photo from flight testing shows simple construction and general arrangement. Note battery still on bottom of model.

Right: Three-quarter rear view of the Flying Aces Stick replica shows ideal proportions for a sport model.

particular, the fin must be aligned with the centerline of the fuselage.

If you will be flying your Stick mostly indoors in small areas, it is recommended that the wing be offset in the usual Indoor manner. (See the sketch on the plan.) However, if space is no object, mount the wing centered. Be certain that the leading and trailing edges mount squarely on the cabanes for good glue joints.

Battery installation can only be done with the model completed because the batteries must be used to balance the model for flight. Attach the batteries to the underside of the model with double-sided tape and a rubber band. Start just behind the midpoint of the wing chord. Glide the model (into grass, if possible), and adjust the fore-and-aft position of the batteries until the glide is smooth and level, and shows no indication of stalling or diving.

Carefully mark the battery position, solder the switch and a motor wire to the battery terminals, and install in the same position above the floor pan, using the double-sided tape. Add the 1/32 plywood doubler on the bottom of the floor pan at approximately the midpoint of the batteries, drill two 1/32 holes on each side of the batteries, and use a wire bail to firmly hold the batteries in place.

The model is completed by soldering the battery and switch leads to the motor, making sure that the polarity is correct for clockwise motor rotation (for a right-hand prop). If you are using the wooden prop that comes with the motor, carefully shape the blades, and balance the prop. Finish with several coats of dope, and rebalance. This propeller is ideally suited to the characteristics of the motor. However, in case of breakage, an interim substitute can be made from a Cox 4.5 x 2, cut down to 3.75 inches in diameter and lightened as much as possible. Even so, it will be nearly a gram heavier than the wood prop and will necessitate rebalancing the model.

Flying Aces Stick

Type: FF Electric Sport

Wingspan: 15½ inches

Engine size/type: KR1 subminiature

Flying weight: 24 grams

Construction: Built-up

Covering/finish: Japanese tissue and Lite-Coat dope

Flying: My adjustment philosophy is that once the model is gliding to the flier's satisfaction, all necessary subsequent adjustments should be made to the thrust line. The following sequence reflects that philosophy. If the individual flier's philosophy differs, no matter; there is really nothing set in concrete in modeling.

If you are flying in a restricted area, it is advisable to first adjust the glide circle to fit your area. Then, under low power, adjust the thrust line so that the model will climb circles of the same diameter. I found that approximately 1.25-1.5 degrees of right thrust was necessary to overcome the torque effect and achieve nearly equal left-hand circles under power and in the glide.

From takeoff, my model has done 1:41 under a 24-foot ceiling, with only a 40-second charge, at a .7A rate (approximately ⅙ capacity). It is indeed unfortunate that some manufacturer does not make Ni-Cds smaller than 50 mAh, as a full charge on these would put our little F.A. Stick far out of sight, on a six-minute-plus motor run! Do you see why we need smaller Ni-Cds?

FLY ELECTRIC! ✈